Analysis of a potential new model for neurovascular coupling in retina and its relation to the retinal relaxing factor

Doel

Neurovascular coupling is extensively studied in brain. However, much less is known about neurovascular coupling in retinal circulation. The aim of the project is to investigate neurovascular coupling in retina using a potential new model.

Methodes

Experiments were performed using isolated retinal arteries with adherent retinal tissue mounted for isometric tension recording. After precontraction of the arteries with $PGF_{2\alpha}$ (30 µM) electrical field stimulation (EFS) was applied by a stimulator via two parallel platinum electrodes on each side of the artery.

Resultaten

EFS (train duration 20sec; frequency 0.125 - 8Hz; pulse duration 5msec; 80V) elicited a rapid and reversible frequency dependent relaxation of arteries with retina. Only a minimal relaxation was observed in arteries without retinal tissue. Applying EFS on non-precontracted arteries only induced a small vasocontraction at 4 and 8 Hz. N^{ω}-nitro-L-arginine (0.1 mM), indomethacin (10 µM), atropine sulphate (1 µM), precontraction with 120 mM K^{+}, ω-conotoxin MVIIC (1 µM) or fluorocitrate (0.1 µM) did not affect the EFS response. Tetrodotoxine (TTX, 10 µM) did not block the EFS response at a pulse duration of 5 msec, however TTX blocked the response at 8 Hz at a lower pulse duration.

Conclusie

EFS relaxes bovine retinal artery in the presence of retinal tissue. No confounding vasocontractile mediators are released during EFS. Neither the as yet unidentified retinal relaxing factor (RRF), NO, cyclooxygenase metabolites, acetylcholine nor glial cells seem to be involved. The involvement of neurons could not be firmly demonstrated. Further research is necessary to establish whether this is a valid model to investigate NC in retina.